VERMONT

AGENCY OF TRANSPORTATION

FY 2020 Municipal Highway Grant Application

APPLYING FOR: ☑ Structures ☐ Class 2 Roadway ☐ Emergency

MUNICIPALITY: Richmond MUNICIPAL CONTACT (name): Peter Gosselin

MAILING ADDRESS: PO Box 285 Richmond VT 05477

Phone: (802) 434-2631 E-Mail: richmondhighway@gmavt.net

ACCOUNTING SYSTEM: ☑ Automated ☐ Manual ☐ Combination

DUNS #: 019336999 Grantee FY End Month (mm format): 06

DISTRICT CONTACT (name): Ashley Bishop

Phone: (802) 655-1580 E-Mail: ashley.bishop@vermont.gov

SCOPE OF WORK TO BE PERFORMED BY GRANTEE

Location of Work. The work described below involves the following town highway / structure:

TH# 14, (Name) Stage Road which is a class 3 town highway.

Bridge #_____, which crosses _____

Culvert # 1410, for which the original size was 60"x40' and the replacement size is 140"x70"x60'

Causeway: _____

Retaining Wall: _____

Latitude: 44.39 Longitude: 72.93 MM (If Available):

Problem:

Culvert is deteriorated and too short for the crossing. The hydraulic study concludes the culvert is undersized. Guardrails are tipping out from the road due to lack of shoulder. The center of culvert is bowed and showing signs of collapse.

Reason For Problem:

Aged and undersized drainage crossing culvert.

Proposed Scope of Work:

Replace 60"x40' road crossing culvert to a 140"x70"x60' corrugated metal arch pipe with poured in place concrete headwalls. Install new guardrails.

Detailed Cost Estimate (below or attached):

See attached

Estimated Project Amount: $ 224,595 Estimated Completion Date: 11/01/2020

Municipality has complied with 19V.S.A. Section 309(d) regarding "complete streets."	☑ YES ☐ NO
Municipality has adopted Codes & Standards that meet or exceed the State approved template?	☑ YES ☐ NO
Municipality has a current Network Inventory? (less than 3 years old)	☑ YES ☐ NO

Municipality MUST complete the following environmental resource checklist:

EXISTING STRUCTURES: (check all that apply)

☑ Steel Tube Culvert	☐ Concrete Box Culvert
☐ Stone Culvert	☐ Concrete Bridge
☐ Ditch	☐ Rolled Beam/Plate Girder Bridge
☐ Metal Truss Bridge	☐ Wooden Covered Bridge
☐ There are foundation remains, mill ruins, stone walls or other	☐ Masonry Structure
☐ Stone Abutments or Piers	☐ Buildings (over 50 yrs old) within 300 feet of work
☐ Other:	

PROJECT DESCRIPTION: (check all that apply)

☐ The project involves engineering / planning only	☐ The project consists of repaving existing paved surfaces only
☐ The project consists of reestablishing existing ditches only within existing footprint	☑ All work will be done from the existing road or shoulder
☑ The structure is being replaced on existing location / alignment	☑ There will be excavation within 300 feet of a river or stream
☐ New structure on new alignment	☐ Repair/Rehab of existing structure
☐ There will be excavation within a flood plain	☐ Road reclaiming, reconstruction, or widening
☐ Tree cutting / clearing	☑ Temporary off-road access is required
☐ New ditches will be established	☐ The roadway will be realigned

The municipality has included photos of the project. Must show infrastructure and surrounding features as much as possible. ☑ YES ☐ NO

Below this line to be filled in by VTrans staff:

Recommended Award Amount:

District Staff Approval: (name) _____ Date: _____

Note:
Projects may involve impacts to protected historic or archaeological resources. For more information, responsible parties are encouraged to contact the District staff.

TOWN HIGHWAY STRUCTURES
FY 20 GRANT REQUEST

Location: Stage Road TH 14 (culvert #1410)

Description of existing structure:
The road crossing is 60 inch by 40 foot long corrugated asphalt coated metal culvert. The pipe has laid up stone for headwalls on the inlet and outlet ends. The inlet end of the pipe has a 20 foot high Hemlock tree growing out of the headwall. The slope on the inlet and outlet ends of the culvert are vertical approximately 90 degrees. The guardrails are sloping away from the culvert due to lack of shoulder.

Scope of work:
Replace existing 60" x 40' diameter drainage pipe with a 140" x 70" x 60' polymer coated corrugated metal arch pipe. Install poured in place concrete headwalls on both the inlet and outlet ends of the culvert. Remove and replace existing guardrails. Install detour sign package. Road closure should be approximately 10 days. Road reduced to one lane after culvert is installed for 2 weeks.

Item:		
Mobilization / demobilization	lump sum	5000
Construction signage and traffic control devices	lump sum	5000
Excavation	all site work	100000
Guardrails remove and replace (150 lf)	200' @ $30.00	6000
Culvert 140" x 70" x 60' arch pipe	60' @ $262.00	15720
Culvert bands	520.00	1040
Retention sills	8 x 495.00	3960
Freight for new culvert	lump sum	600
Drainage stone	200 ton @ $12.50	2500
Type III stone	50 ton @ $16.50	825
Bank run gravel	200 ton @ $10.00	2000
Plant mix gravel	150 ton @ $13.00	1950
Jersey barriers	lump sum	10,000
Trucking	40 hours @ $100.00	4000
Job site illumination	lump sum	3000
Inlet headwall (concrete)	lump sum	25000
Outlet headwall (concrete)	lump sum	25000
Topsoil seed and mulch	lump sum	3000
Engineering, easements and plans	lump sum	10000
Project total		$224,595
Maximum allowable project state grant funding	**$175,000**	
State 80% match	**$175,000**	
Town 20% match	**$49,595**	

submitted by: Peter Gosselin 4-5-19

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March 23, 2018

Town of Richmond
Attn: Pete Gosselin, Road Foreman
203 Bridge Street
Richmond, VT 05477

RE: Hydraulic Study – Stage Road (TH14)
GPS Coordinates: 44.39374 N / -72.93248W
Waterbody: Unnamed tributary to the Winooski River

Project Understanding

East Engineering has completed a preliminary hydraulic study for the above referenced site and has summarized details of the study in subsequent sections of this letter. A site visit was conducted on March 21, 2018 to visually inspect the stream, road, and culvert conditions. Due to heavy snowpack and ice conditions, approximate measurements were completed for the road, stream, and culvert. Measurements should be refined/confirmed, and this study revised (if necessary), once the site clears of snow/ice.

Hydrology

This site consists of a hilly/mountainous drainage basin, is primarily wooded with steep grades, and is located in a rural setting. Near the road crossing, the stream channel slope averages approximately 7%, however, there is a mix of areas that have plunges (steeper than 7%) and sections that meander (shallower than 7%). The area immediately upstream and downstream of the culvert (approximately 50' either direction) have a channel slope of approximately 2-4%. The total drainage area upstream of the culvert inlet is approximately 0.95 mi^2.

The following design flow rates were obtained from USGS StreamStats:

Recurrence Interval (Years)	Flow Rate in Cubic Feet Per Second (CFS)
Q2	53
Q10	114
Q25	154 (Local Road Design)
Q50	190
Q100	229 (Check Flow)

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Channel Morphology


Upstream channel of un-named tributary.

This stream channel is steep and consists of large boulders, ledge outcroppings and plunge pools. Both inlet and outlet banks are steep and wooded. The bank full width varies and ranges from 8-12 feet, with several larger pool areas (depending on boulder/ledge locations) and several narrow channel locations. The depth of the stream varies and is shallow at some of the drops and has several pools that are several feet deep. The culvert inlet sits in a topographic depression, which has collected debris during higher flow events. The outlet channel appears to be slightly scoured due to higher velocities caused by the undersized culvert. The outlet channel generally parallels Stage Road in the vicinity of the project.

Existing Conditions


5' diameter CMP inlet and road embankment.

The existing structure is a 5' diameter corrugated metal pipe culvert, which is both galvanized and tar coated, providing approximately 20 ft^2 of waterway opening. The top half of the culvert appears to be in fair condition, given the age, however, the bottom portion of the culvert has lost all galvanized and tar coatings and shows signs of corrosion and deterioration. The inlet headwall of the culvert is stacked stone, which is in poor condition and is deteriorating. Due to the grade difference between the road and the stream, both the inlet and outlet slopes above the headwalls are very steep and show signs of erosion.

The structure is not in compliance with the VTrans Hydraulic Manual, does not meet bankfull width requirements, and restricts aquatic organism passage (AOP). Hydraulic calculations for the existing culvert were completed using *HY-8 Culvert Hydraulic Analysis Program*, published by the US Department of Transportation, Federal Highway

Administration. Results show that headwater depths do not overtop the roadway, however, are not in accordance with the VTrans Hydraulic Manual. Headwater depths of 5.7' at Q100 and 4.2' at Q25 were calculated.

Replacement Recommendations

The span, geometry, and installation method of the replacement structure should meet several criteria, including:

- Vermont Stream Alteration General Permit
- VTrans Hydraulic Manual Standards

Based on the preliminary sizing information, the following structures should be considered. Minimum requirements include a 11' clear span and 44 ft^2 of waterway opening. The structure criteria should be further evaluated during final design to ensure compatibility with site conditions.

1. Metal Pipe Arch (Galvanized Steel or Aluminum): Exact structure dimensions vary by manufacturer, however, a structure with approximate dimensions of 11'-8"x5'-9" will provide the required waterway opening and minimum span. Pipe arches are manufactured with both closed bottoms and open bottoms. Open bottom is preferred, however, if a closed bottom is utilized, sills should be spaced at 8' increments and be "V" shaped (12" at sides, 8" in middle). Natural stream gravel or a clean (no fines) cobble/stone product should be added between sills. Concrete footers/pedestals/headwalls will be required to complete the structure installation. This structure will result in headwater depths of approximately 3.3' at Q25 and 4.8' at Q100 with no roadway overtopping.
2. Precast Concrete Box Culvert: The structure should have an 11' span and 6' high (inside opening). The box invert should be buried approximately 2' below natural stream channel elevations, which would result in an opening of 11'x4' (44 ft^2). The box culvert should have sills spaced at 8' intervals and be "V" shaped (12" at sides, 8" in middle). The precast concrete box will require headwalls, wingwalls, and cutoff walls for a complete installation. This structure will result in headwater depths of approximately 2.5' at Q25 and 3.4' at Q100.
3. Any similar structure that meets the minimum requirements of this analysis and the site conditions.

General Comments

Regardless of the selected replacement structure, several common items should be implemented.

1. If a closed structure (4-sided concrete box, or pipe arch) are used, the inverts should be buried to a level of 2' below natural channel elevation.

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2. The wingwalls and cutoff walls should extend 4' below the invert of the streambed, or to ledge, to prevent undermining of the structure.
3. Wingwalls should be used to transition from the road grade to the stream banks. Properly sized wingwalls will mitigate road bank erosion issues and also provide additional protection from stream undermining/scouring.
4. Type III stone should be used to armor/anchor the transition from the wingwalls to the surrounding ground and for the culvert inlet/outlet.
5. Both US Army Corps of Engineers and Vermont Agency of Natural Resources – Stream Alteration should be contacted during the design phase to ensure the proposed project complies with applicable permitting standards.
6. Metal pipe arches have specific requirements regarding backfill and cover between top of structure and roadway elevation. The site should be able to provide adequate cover; however, this should be evaluated during final design.
7. As previously noted, due to snowpack/ice, approximate dimensions were obtained for the hydraulic calculations. Prior to final design, field dimensions should be confirmed, and design flows calibrated.

Please let me know if there are any questions or you need any additional information.

Sincerely,

Tyler Billingsley, P.E.
Engineer / Owner

STAGE ROAD CULVERT # 1410